REMARKS

Claims 4-5, 9-10, 13, 16, 19-20, 22, and 24 are now pending in the application. Claims 1-3, 6-8, 11-12, 14-15, 17-18, 21, and 23 have been canceled without prejudice or disclaimer. Claims 4, 9, 13, and 16 have been amended without introduction of new matter. Favorable reconsideration is respectfully requested in view of the above amendments and the following remarks.

Before addressing the specific issues raised in the Office Action, it is noted that claims 4, 9, 13, and 16 have been amended to change various forms of the word "minimize" from their British spelling to the standard American spelling. In claim 9, the word "signals" had inadvertently been omitted from one recitation of the phrase "inphase and quadrature (I and Q) signals", and is therefore now being inserted. Also, claim 16 has been amended to correct a typographical error (i.e., the phrase "in dependence upon respective time delays and to supply the adjustment control signals" had inadvertently been duplicated in the last paragraph of the claim). None of these amendments introduce new subject matter, nor do they reduce the scope of any claim.

The drawings were objected to as being informal, but were deemed to be acceptable for examination purposes. As suggested by the Examiner, Applicant will file formal drawings when the application is allowed.

The Abstract of the disclosure was objected to because of an informality. In response, the Abstract has been amended to remove the term "[Fig 1]". It is therefore respectfully requested that the objection to the Abstract be withdrawn.

Claims 1-3, 6-8, 11-12, 14-15, 17-18, 21, and 23 stand rejected under 35 USC §102(b) as allegedly being anticipated by Valentine et al. (US Patent 5,748,678). This rejection has been rendered moot by the cancellation of these claims. Accordingly, it is respectfully requested that this rejection be withdrawn.

Claims 4-5, 9-10, 13, 16, 19-20, 22, and 24 stand rejected under 35 USC §102(e) as allegedly being anticipated by Suga et al. (US Patent 6,771,708 B1). This rejection is respectfully traversed.

The invention relates to digital communications systems that use non-constant envelope modulation schemes, whereby some part of the information lies in the amplitude (envelope) of the transmitted signal and some part lies in the phase of the transmitted signal. In other words, this is a combination of Amplitude Modulation (AM) and Phase Modulation

(PM). To deal with amplitude modulation, an output power amplifier in the radio transmitter needs to be linear, that is, the relationship between the output power of the power amplifier and the input power of the power amplifier needs to be linear for all possible power levels. Otherwise the result will be AM-to-AM distortion.

Similarly, to deal with the phase modulation, the phase shift through the power amplifier has to be constant for all possible power levels. Otherwise the result will be AM-to-PM distortion, that is, the phase shift of the power amplifier changes with the input amplitude.

The consequences of using a power amplifier with non-constant gain and/or non-constant phase shift will be amplitude distortion and/or phase distortion in the transmitted signal. Because such distortion can seriously degrade performance of the communication system, linearity is crucial for transmitter used in a digital modulation system with non-constant amplitude modulation. Moreover, high linearity requirements often lead to poor power efficiency. To attain good linearity and good power efficiency, some linearization methods and/or some efficiency enhancement methods are often used. A problem that often arises, however, is poor time alignment in the modulated signal between the "information parameters" (or "information components"), i.e., between gain and phase (polar representation) or alternatively between I and Q (Cartesian representation). That is, if one assumes a polar representation, the magnitude (r) and phase (f) should be adjusted so that no time error exists between these two information components "at the antenna" (i.e., at the RF output of the RF transmitter). Similarly, if one instead uses a Cartesian representation, the "information components" will be represented by the Inphase (I) and Quadrature (Q) signals, and these two signals should be adjusted so that no time error exists between them "at the antenna".

The Application describes some embodiments that utilize polar representation. The solutions presented for such embodiments have the purpose of making sure that, at each moment and at the RF output of the transmitter, the magnitude values are associated with the phase values that they ideally should be associated with. (Note: In this context, the term "phase" refers to the phase in a polar baseband representation.)

The Application also describes some embodiments that utilize Cartesian representation. The solutions presented for such embodiments have the purpose of making

sure that, at each moment and at the RF output of the transmitter, the Inphase values are associated with the Quadrature values that they ideally should be associated with.

In all embodiments, then, the goal is to ensure that the information that is transmitted does not become distorted or corrupted due to an erroneous timing difference between the information components (i.e., the timing between r and f, or alternatively between I and Q).

Accordingly, independent claim 4 defines a step of "adjusting the generated amplitude and phase signals", wherein that step comprises " detecting an output RF signal to produce detected amplitude and phase signals; subjecting the generated phase signal to a first time delay to produce a delayed phase signal, <u>the first time delay being such as to minimize a difference between the delayed phase signal and the detected phase signal</u>; subjecting the generated amplitude signal to a second time delay to produce a delayed amplitude signal, <u>the second time delay being such as to minimize the difference between the delayed amplitude signal and the detected amplitude signal</u>; and adjusting the generated amplitude and phase signals in dependence upon the first and second time delays." (Emphasis added.)

Independent claim 9 similarly defines a step of " adjusting the generated inphase and quadrature (I and Q) signals", where that step comprises "detecting an output RF signal to produce detected inphase and quadrature (I and Q) signals; subjecting the generated inphase (I) signal to a first time delay to produce a delayed inphase (I) signal, <u>the first time delay being such as to minimize a difference between the delayed inphase (I) signal and the detected inphase (I) signal</u>; subjecting the generated quadrature (Q) signal to a second time delay to produce a delayed quadrature (Q) signal, <u>the second time delay being such as to minimize the difference between the delayed quadrature (Q) signal and the detected quadrature (Q) signal</u>; and adjusting the generated inphase and quadrature (I and Q) signals in dependence upon the first and second time delays." (Emphasis added.)

Independent claim 13 defines an apparatus for adjusting timing of phase and amplitude components of an RF signal, the apparatus comprising, *inter alia*, "a delay unit connected to receive the generated phase and amplitude signals and operable to delay those signals by respective time delays to produce delayed phase and amplitude signals, <u>the respective time delays being determined such that respective differences between detected and delayed phase and amplitude signals are minimized"</u>. (Emphasis added.)

Independent claim 16 defines an apparatus for adjusting timing of inphase and quadrature (I and Q) components of an RF signal, the apparatus comprising, *inter alia*, "a

delay unit connected to receive the generated inphase and quadrature (I and Q) signals and operable to delay those signals by respective time delays to produce delayed inphase and quadrature (I and Q) signals, <u>the respective time delays being determined such that respective differences between detected and delayed inphase and quadrature (I and Q) signals are minimized</u>". (Emphasis added.)

The Suga et al. patent fails to anticipate any of independent claims 4, 9, 13, and 16 at least because it neither discloses nor suggests any arrangement for delaying generated phase and amplitude signals, or alternatively inphase and quadrature signals, wherein the respective time delays are determined such that respective differences between detected and delayed versions of a signal component are minimized, as variously defined in the claims. The Suga et al. patent describes a method for compensating for non-linear performance in the power amplifier. The power amplifier output RF signal (referred to herein for convenience as "RF1") is down-converted to a baseband representation, and the same goes for the RF signal from the RF modulator (referred to herein for convenience as "RF2"). To calculate the non-linearity compensation, the delay between the information contents in RF1 and that of RF2 must be found first. There are thus some fundamental differences between the Suga et al. patent and the various embodiments defined by Applicant's independent claims. For example, Suga et al. do not address, and have no means for compensating for the time delay that could appear between the amplitude information and the phase information in a polar coordinate system or, in a Cartesian system, between the Inphase and the Quadrature parts of the information. As described earlier, this is the main purpose of the various embodiments described in the present application.

For at least the foregoing reasons, independent claims 4, 9, 13, and 16 are believed to be patentably distinguishable over the Suga et al. patent. The remaining claims 5, 10, 19, 20, 22, and 24, variously depend from independent claims 4, 9, 13, and 16, and are therefore patentable for at least the same reasons as those set forth above. Therefore, it is respectfully requested that the rejection of claims 4-5, 9-10, 13, 16, 19-20, 22, and 24 under 35 USC §102(e) be withdrawn.

The application is believed to be in condition for allowance. Prompt notice of same is respectfully requested.

Respectfully submitted,

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